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BULLETIN OF THE MILWAUKEE BUREAU OF ECONOMY AND EFFICIENCY

NO. 13

HEALTH DEPARTMENT

I. MILK SUPPLY

MILWAUKEE, WIS.
JANUARY 30, 1912

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BUREAU OF ECONOMY AND EFFICIENCY

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MILWAUKEE
BUREAU OF ECONOMY AND EFFICIENCY

Created by Common Council
For the Investigation of Departmental Accounts and Methods.
Resolution Adopted June 14, 1910.

BULLETIN NO. 13

HEALTH DEPARTMENT

1. MILK SUPPLY

BY
SELSKAR M. GUNN

PREPARED UNDER THE DIRECTION OF
JOHN R. COMMONS

MILWAUKEE, WIS.
January 30, 1912

PUBLISHED SEMI-MONTHLY
Entered as Second Class Matter Oct. 27, 1911 at the
Post Office at Milwaukee, Wisconsin,
under the Act of July 16, 1894.

LETTER OF TRANSMISSAL

CITY OF MILWAUKEE,
BUREAU OF ECONOMY AND EFFICIENCY.

Milwaukee, September 6, 1911.

Dr. F. C. Kraft,
Commissioner of Health.

Dear Sir:

We submit herewith the report of the Bureau of Economy and Efficiency on the Milk Supply of Milwaukee and Its Control by the Health Department.

This investigation—into one of the most vital problems of the city—has included careful studies of the conditions of production, transportation, and distribution of milk with respect to the sanitary aspects of the question. Inspections have been made of milk plants, retail stores and farms; studies have been made of transportation; and many samples of milk have been tested bacteriologically. All these lines of investigation have been followed with the idea of finding out in how far existing conditions are good or bad, and of discovering what improvements should be made to assure to the citizens of Milwaukee a clean, safe milk supply.

As a result of this investigation a number of recommendations are made, the adoption of which, it is believed, will accomplish in a large measure the desired results.

Mr. Peter Rasmussen made the investigations of the milk plants, stores and farms; Messrs. A. C. Baer and A. G. Zander, the bacteriological investigations; Mr. Fred Merk, the milk maps; and Miss Aimee Zilmer and Miss Anna Zillman assisted in the preparation of the report. The thanks of the bureau are due these persons for their interest and enthusiasm in the work.

The officials of the Health Department have assisted materially in this investigation and special thanks are due Dr. George C. Ruhland and his assistant for extending all the facilities of the bacteriological laboratory, and to Mr. George J. Steffen, milk inspector, for assistance in collecting much of the data contained in the report.

Respectfully submitted,
(Signed) J. R. COMMONS, Director.
(Signed) B. M. RASTALL, Associate Director.

THE MILK SUPPLY OF THE CITY OF MILWAUKEE AND ITS CONTROL BY THE HEALTH DEPARTMENT

INTRODUCTION

No one who has made a careful and scientific study of the milk problem can fail to see the intimate relation of a city's milk supply to its health. Dirty and contaminated milk is one of the serious menaces to the public health. It is particularly dangerous to bottle-fed infants, and besides can act as a carrier of the organisms of scarlet fever, typhoid fever, diphtheria and tuberculosis. To tolerate conditions which produce such evil results is to encourage the maintenance of a high mortality among the preventable causes of death.

Milwaukee, like other cities, has its milk problem, and even if it is not as serious as in some other places, it is far from being solved and much remains to be done.

The general objects aimed at by cities in attempting to safeguard the milk to be consumed have been:

1. To have the milk of healthy cows handled by healthy attendants;
2. To minimize the danger of contamination of milk through dirt and specific disease producing organisms on the farm, during transportation, and while in the care of wholesale and retail dealers;
3. To maintain a reasonable and effective temperature standard;
4. To fix the age limit of the milk that may be sold; and
5. To prevent adulteration and sophistication and the use of preservatives, and to maintain milk and cream standards.

So much has been written on the dangers of dirty and infected milk that it is not considered necessary here to repeat the well known truths. The purpose of this report is to discuss the general milk situation in Milwaukee, particularly from the point of view of Health department control; and to make recommendations as to how this control and supervision can be improved. It is not to be considered as a complete study of all phases of the question. Much work will yet have to be done before the problems can be solved in a satisfactory manner.

With the growth of the city and the resulting spread of the "milk shed" and increase in the number of milk handlers, the dangers are multiplied and the amount of inspection of all milk processes must be increased proportionately.

Predictions of milk famines and great increases in the price of milk always follow upon recommendations that look towards the sanitary control of a city's milk supply and the elimination of the insanitary farmer and dealer, but experience has shown that as far as famines are concerned there is no need for alarm, and as for the increase in price, it has never been particularly excessive, and a sanitary milk is worth the increase.

GENERAL STATISTICS

The daily consumption of milk in Milwaukee amounts to approximately 30,360 gallons, an average per capita of 0.64 pints per day. Besides this a large quantity of cream is sold, 1,623 gallons by retailers alone; this figure does not include the vast amount shipped directly to ice-cream factories.

Approximately 1,900 dairy farms supply the city's milk and cream; less than 300 of these ship cream. This does not include those that supply ice-cream factories on which point no figures are available. About 95% of the milk comes directly from farms within forty-five miles of Milwaukee. Cream shipments are usually longer and a large per cent. is supplied by creameries. Wholesale wagons, railroads and one electric line carry 53%, 42%, and 5% of the milk respectively. Except as to the milk retailed by dealers near the city and a small quantity of certified milk, all shipments are made in cans of eight gallons capacity. Most of the milk delivered to the consumers is from twenty-four and forty hours old.

The certified milk is controlled and regulated by the County Medical association. A small amount of high test milk from tuberculin tested herds is sold at prices as high as fourteen cents per quart; no special control is exercised over this quality of milk. All other milk is sold at six cents in summer and seven cents in winter.

There are 188 retail milk dealers distributing milk from wagons to homes and stores within the city limits. Stores handle from 20% to 25% of all the milk. They are especially important in the poorer districts where they enable people of scanty means to obtain fresh, cool milk at any time. Fourteen hundred stores were licensed in 1910, but there is reason to believe that there were no more than 1,100 or 1,150 stores selling milk at one time. These stores are well distributed, especially in the poorer districts.

RETAIL MILK TRADE

The 3,800 cans of milk and 1,800 gallons of cream are delivered to stores and homes by 188 dealers, using 412 milk wagons. The average load is seventy-eight gallons per wagon. Table I shows the general status of the milk trade.

Seventy-four per cent. of the milk sold is bottled. City retailers bottle 77% of the milk handled by them, retailers outside of the city 39% and retail farmers 25%. Fifty-nine per cent. of all the milk and 80% of the cream is pasteurized. Only city dealers, and usually only those who handle at least twenty-five cans per day, pasteurize; others consider it too expensive or unnecessary. None of the retailers outside of the city or retail farmers pasteurize.

Concentration of Output in Retail Milk Trade

The fact that 188 dealers distribute not quite 3,800 cans of milk does not seem to indicate concentration. A study of Table II shows, however, that 61% of the total milk supply is handled by ten dealers, 52% by four dealers and 36% by one dealer.

TABLE I.

MILK SUPPLY—MILWAUKEE.

GENERAL STATISTICS.

			MILK.					CREAM.		
	Number of Dealers.	Number of Wagons.	Number Cans Handled.	Number Cans Bottled.	Percentage Bottled.	Number Cans Pasteurized.	Percentage Pasteurized.	Number Gallons Handled.	Number Gallons Pasteurized.	Percentage Pasteurized.
City retailers	139	363	3,511	2,721.5	77	2,238	64	1,807.5	1,463	81
Retailers living outside city......	22	22	175	68.5	39	0	0	16	0	0
Retail farmers	20	20	89	22.5	25	0	0		0	0
Not visited	7	7								
Totals	188	412	3,796	2,812.5	74	2,238	59	1,823.5	1,463	80

Capacity of can—8 gallons.

Score of City Milk Depots

Of the 139 milk depots within the city limits 130 were visited and scored. Seventeen retailers of milk who carried on their business outside of the city were also scored. The United States Department of Agriculture score card was used.

The depots scored an average of 43.8%. The scores of the small dealers were uniformly lower than those of the larger establishments. To show the scores and at the same time note the difference between large and small dealers, an arbitrary division was made. Here, and in all following tables, the handler of less than ten cans per day will be classed as a small dealer; all above, large dealers. (Table III)

Location of Milk Depots and Plants

Many milkmen seem to consider any available space appropriate for a milk depot, when on the contrary it should be carefully selected with attention paid to drainage, ventilation, light and surroundings. Milk depots were found next to barns and chicken-coops, in furnace rooms, and near toilets. One man was found bottling milk in a basement; the only light and ventilation were admitted by a small transom over a door. A tankful of rotten water, a foul smelling toilet, and a defective house-drain filled the room with most repulsive odors. This man insisted that he had as good a place for carrying on the milk business as anyone else in the city. This case is not given as representing the average condition.

A few basement rooms were satisfactory, but it is so difficult to properly light and ventilate a basement, to keep it free from odors and street dust with its pulverized horse droppings, as well as heaps of rubbish, that basements are as a whole justly condemned as milk depots. The Health department is working towards the elimination of basement milk plants.

Construction of Milk Rooms

Table IV, among other averages, shows the average score for construction of milk rooms. The low score of outside dealers is largely due to lack of proper drainage facilities. The very fact that many milk rooms are located in basements suggests the undesirable construction of such quarters. Rough, cracked ceilings

TABLE II.

CONCENTRATION OF RETAIL MILK BUSINESS.

	No. of Dealers.	No. cans of milk handled.	Average No. cans per Establishment.	Per Cent. of total Dealers.	Per Cent. of total milk handled.
All dealers	188	3,796	20	100	100
Dealers within city limits...	139	3,510	25	74	93
Dealers within city limits handling over 10 cans per day	63	3,026	48	33	80
Dealers within city handling less than 10 cans per day	76	884	6	40	13
Ten largest dealers..........	10	2,303	230	5	61
Four largest dealers.........	4	1,975	443	2	52
Largest dealer	1	1,350	1,350	5	36

TABLE III.

SCORES OF MILK DEPOTS.

	No.	Aver. Score in %	Under 30%	30—40%	40—50%	50—60%	60—70%	70—80%	80—90%	90—100%
Large city plants...	60	48.7	2	16	14	20	6	1	0	1
Small city plants....	70	39.3	9	25	27	6	3	0	0	0
Outside retailers.....	17	45.3	0	5	6	4	2	0	0	0
Totals	147		11	46	47	30	11	1	0	1

Maximum score given......	93 %	Maximum possible..........	100%
Minimum " "	12 %	Depots not scored...........	14
Average " "	43.8%		

and walls, and faulty plumbing with sewer gas escaping were found in some instances.

Light and Ventilation

The objectionable conditions found under this heading are largely a consequence of basement rooms. In numerous cases rubbish piled outside the windows, or dirty panes, excluded every ray of light; over some windows papers were tacked or shades were drawn to keep out the light. The wretched conditions are enhanced by the ignorance of the milk dealers; many depots having plenty of window space were dark because the lazy or negligent dealer failed to remove the collection of rubbish piled against his windows.

Equipment of Milk Plants

Table V shows the small dealer at a disadvantage, as far as equipment is concerned; the small amount of trade does not warrant elaborate equipment. If there is an extra room—and most depots consist of only one room—it is used as a milk store room. In such close quarters, where washing and bottling are done, it is almost impossible to keep the room in a sanitary condition.

In a majority of instances the water used to wash bottles was not hot enough nor sufficient in quantity to cleanse the bottles properly. Half a dozen, besides those who pasteurize their milk, heat the water by steam. Three firms maintain steam washers. The majority depend on coal stoves or gas burners for their hot water supply. The equipment was generally found to be of sanitary construction, but the crowded conditions and the ignorance of dealers often nullified its good effect.

Handling of Milk at City Milk Depots

The scores of Table IV also show the unsatisfactory handling of milk. Milk arrives in the city between 8 A. M. and 4 P. M. Most of the rail shipments come in by 1 P. M. Small dealers trade almost entirely with wholesale wagons; large firms draw from wagons and railroad depots.

As long as the weather permits, in most places the milk is left exposed in the milk room. In summer, it is immediately placed in cold water or on ice, except at plants where it is pasteurized or bottled. Dealers pasteurize at times most convenient to them.

Straining of milk is very imperfect; the cheese cloth used is in many cases filthy. Bottling is done by machine in ninety-six cases. Caps are generally inserted by hand. After bottling, the milk is put on ice. Ordinarily no ice is used on the delivery wagons. In very hot weather a little chipped ice is sometimes used. Milk is delivered between 2:30 A. M. and 9 A. M. Many outside retailers and a few city dealers get their milk from the farm soon after it is produced, and deliver it from twelve to twenty-four hours sooner than it would reach the customers if handled in the usual way by railroad or wholesale wagon. However, only about 150 cans daily are so delivered.

Cleanliness of Milk Rooms and Equipment

Not until ignorance, indifference and carelessness among milk handlers is overcome can a city expect to get a supply of sanitary milk. Good laws are useless if not properly enforced through constant inspection. Table IV devotes a column to scores of cleanliness of wagons, rooms and equipment. Out of a possible twenty-nine points for cleanliness, the large city dealers on the average scored 15.3; the small city dealers 14.3; and retailers outside of the city 13.4.

Small and crowded rooms have before been mentioned as frequently being accompanied by filth. The city ordinances demanding that utensils used in connection with milk be sterilized is more often violated than obeyed. After the bottles have been hastily washed in only warm water (to say nothing of being sterilized) they are usually rinsed in cold city water. Bottles are not always satisfactorily drained.

Little attention is paid to the cleanliness of bottle caps. In a large number of cases, caps were found exposed in barrels and boxes, or shelves and window sills, covered with dust and at times moldy.

Three bottling machines were found in a vile condition. Four dealers still use the old insanitary rubber tube bottling machine. In the smaller plants the work of washing bottles

TABLE IV.

DETAILS OF MILK DEPOTS SCORED.

	NO.	Aver. Score, Location of Milk Room. (Possible 10)	Aver. Score, Construction Milk Room. (Possible 10)	Aver. Score, Equipment Milk Plant. (Possible 10)	Aver. Score, Light and Ventilation. (Possible 10)	Aver. Score, Handling and Storage. (Possible 20)	Aver. Score, Cleanliness. (Possible 29)	Aver. Score.
Large city plants (10 cans or more)	60	4.6	5.6	6.5	5.2	10.8	15.3	48.7
Small city plants (less than 10 cans)	70	3.1	4.8	5.5	5	8.9	14.3	39.3
Outside retailers	17	4.8	5.1	4.6	4.6	10.3	13.4	45
Totals	147	3.9	5.2	5.8	5.0	9.8	14.6	43.8

Maximum total score.. 93 points

Minimum " " .... 12 "

Possible " " .... 100 "

Eleven points are also allowed for condition of salesrooms and wagons. The marks given are not shown in a special column, although they are included in the total scores.

TABLE V.

EQUIPMENT OF MILK PLANTS.

	No.	Possible Score for Equipment—10.	Having Bottling Machines. No.	Without Bottling Machines. No.	Not Known. No.	Wash Utensils in Milk Rooms. No.	Heat Water in Kitchen. No.	Pasteurized. No.	Capping Machines. No.	Washing Machines. No.
Large city plants....	60	6.5	51	7	2	48	6	18	3	3
Small city plants....	70	5.5	40	25	5	49	12	1	0	0
Outside retailers......	17	4.6	5	9	3	13	4	0	0	0
Totals	147		96	41	10	110	22	19	3	3

and utensils was usually attended to by the milkman and his wife, though in some cases it was left to the children.

Pasteurizing machines and bottlers were usually found clean, but both were often located too near sources of contamination, such as engines and coal bins.

Delivery wagons were found in fairly good condition, especially the city wagons. The outside dealers had poorly constructed wagons. Milk cans were frequently carelessly rinsed and not washed.

Restaurants and hotels which buy milk in wholesale quantities from dealers are especially lax in washing cans, and frequently return them filthy and vile smelling. Defective cans were also found.

Large firms sell their surplus milk to candy factories, bakeries, and cottage cheese makers.

In very few cases were clean milk suits worn. In only a few instances are employes required to wash their hands before handling the milk. Personal cleanliness is usually left to the individual, rather than insisted upon by an authority.

It is evident from what has been written that many of the milk depots are deficient. Much improvement could be obtained in a large number of places by the introduction of simple cleanliness. The need for very frequent inspection of those places is apparent, and it must be accompanied by education. Many, if properly informed, would be willing to conform to reasonable rules and regulations. There are people in the milk industry who have none of the necessary qualifications for the business. Constant inspection and the proper enforcement of the ordinances will go a long way towards causing many of the incompetent and dangerous milk dealers to quit the business.

Milk Stores

Of the 1150 stores (approximate estimate), 243 stores, or 21%, were investigated. Except in the special investigation, made for the Child Welfare commission, no score cards were used.

Two hundred and five stores sold 5,206 quarts of milk, an average of 25.4 quarts per day. Assuming this as an average, the 1,150 stores sell a daily total of 913 eight-gallon cans or 24% of the total milk supply.

All milk from stores is sold in bottles, a regulation enforced by the Health department, though not embodied in the Milk Ordinance. About 40% to 50% of this is put up in pint bottles. In the Third ward several stores sold milk in half pint bottles. Eighty-five per cent. of the milk sold in thirty-two stores was pasteurized.

Table VI shows the kinds of stores selling milk and their comparative cleanliness. The ice boxes were usually clean—cleaner in fact than the stores. Small places were well kept, and their ice boxes showed lower temperatures than those of the larger stores. The chief objection to the condition of the ice boxes was that all kinds of perishable goods were kept in them together with the milk.

TABLE VI.

INSPECTION OF STORES.

GENERAL CLEANLINESS.

WINTER AND SPRING 1911.	Totals.	Total Percentage.
No. of stores	217	100
Grocery	157	71.4
Bakery	56	26.7
Other	4	1.8
Cleanliness of Store—		
Good	82	37.8
Fair	90	41.4
Poor	45	20.7

Table VII shows the condition with regard to the actual care of the milk in the stores at different times of the year. In many cases store keepers were careless with their milk during the spring and looked after it properly only when the hot weather came.

Temperature of Milk in Stores

Temperatures of milk in ice chests were noted during May and June. Reasonable precautions were taken to keep milk at the legal temperature of 50 degrees F., but this seems impossible

TABLE VII.
INSPECTION OF STORES.
GENERAL CARE OF MILK.

WINTER AND SPRING 1911.	Visited before April 15.		April 28—29		May 5—9		June 1—15.	
Total No. of Stores	112	100%	34	100%	32	100%	39	100%
No. of Stores Milk in Ice Box, not iced	19	16.99%	7	20.6%	8	25%	0	0
" " " " " " " iced or in water	14	12.5%	12	35.3%	24	75%	38	97.4%
" " " Milk on floor	30	26.8%	10	29.4%	0	0	1	2.6%
" " " " " shelves	45	40.2%	3	8.8%	0	0	0	0
" " " Condition not noted	4	3.6%	2	5.9%	0	0	0	0

TABLE VIII.
TEMPERATURE OF MILK SOLD IN STORES.

Month of inspection.	No. of stores.	No. under 40° F.	No. 41°—45° F.	No. 46°—50° F.	No. 51°—55° F.	No. 56°—60° F.	No. 61°—65° F.	No. 66°—70° F.
May, 1911	31	1	2	2	9	10	7	0
June	59	0	1	3	13	19	18	5
Totals	90	1	3	5	22	29	25	5

Within Legal Standard (30)...... { May, 1911, 16.1% / June " 6.7%

Above Legal Standard (60)....... { May, 1911, 22.5% / June " 38.9%

with the present type of ice box. The small ice box, opening on top, showed the lowest temperature. In May only 16.1% of the temperatures noted were within the legal standard, and in June but 6.7% in spite of the fact that all stores kept the milk on ice during that month. It is safe to say that with the average ice-box and under summer conditions at least 75% of the stores were unsuccessful in conforming with the temperature requirement. Table VIII gives the details of this work.

On the whole, milk is handled in a fairly satisfactory manner in the stores and presents one of the least difficult features of the milk situation. On account of the large amount of milk that passes through stores, constant inspection is imperative.

PRODUCTION OF MILK ON THE FARMS

If milk is polluted at its source, it is hopeless to try to deliver a really wholesome product to the consumer.

About 1,900 farms contribute to the city supply; 1,600 of these furnish milk and 300 cream.

It was not possible to visit many of the dairy farms; sixteen were scored, and through the courtesy of the Health department access was had to the records of 131 farms scored by the milk inspectors in 1910, making a total of 147 farms scored, or about 7.7% of the total number. Table IX shows the results of the scoring. The United States Department of Agriculture score card was used. The average score was 33.1 This low average needs no particular comment to persons acquainted with dairy farm inspection. From reliable information it is believed that the results obtained in scoring these 147 farms can be taken as applying in general to the farms supplying the city. Some are doubtless better and some worse. On the farms inspected both equipment and methods were poor and much behind the times. The most important thing to be done to bring up the standard and make the farmers clean up and make necessary alterations or additions to their present equipment, is constant inspection and instruction. This is the first step that should be taken by the Health department in its endeavor to improve the milk supply of the city. Occasional and desultory inspection will not bring about the desired results.

TABLE IX.

FARM SCORES.

	No. of Farms.	Aver. No. Cows per Farm.	Aver. No. gallons per Farm.	Score for equipment. Possible 40.	Score for methods. Possible 60.	Totel Aver. Score. Possible 100.
Summer Months	61	11	25	13.0	21.9	34.9
Winter Months	70	9	22.7	13.0	20	33
April, 1911	16	11.5	25.8	10.5	20.9	31.4
	147	10.5	24.5	12.2	20.9	33.1

TABLE X.

STRIKING IMPROVEMENT ON THE DAIRY FARMS OF RICHMOND, VA., DUE TO INSPECTION.

CLASS.	Percentage of all Dairy Farms Inspected during the Year. YEAR. 1907.	1908.	1909.	1910.
Scoring below 30..................	6.0	...	...	...
Scoring between 30 and 40..........	13.2	...	...	...
Scoring between 40 and 50..........	26.3	.2	...	...
Scoring between 50 and 60..........	30.1	3.2	.3	...
Scoring between 60 and 70..........	18.3	27.6	20.8	2.5
Scoring between 70 and 80..........	5.2	43.1	51.7	47.4
Scoring between 80 and 90..........	.9	23.1	23.1	42.4
Scoring between 90 and 100.........	...	2.8	4.1	7.7
Average of all scores for year....	50.4	74.1	75.8	80.5

It must be regular and frequent, and the inspectors should act more as instructors than as inspectors, and aid the farmers in every way by advice and encouragement.

The experience of many cities in this work is very encouraging. The remarkable results attained in Richmond, Virginia, during the past four years in the improvement of the sanitary condition of the dairy farms by means of inspection, education and publicity are reproduced here in Table X, as an example of what would be possible in Milwaukee under the best conditions.

The Milk Commission of Philadelphia, in its recent report, recommends thirty-seven country inspectors for the 5,473 farms which supply that city. The commission allows for twelve inspections a year of each farm. Estimating on the Philadelphia basis, it would take thirteen men to do the same work for Milwaukee that is recommended for Philadelphia. The Philadelphia commission estimate is made, of course, looking towards an ideal inspection and it seems impractical to suggest the appointment of the proportionately high number of inspectors for Milwaukee.

It would take at least four inspectors to look after the 1,900 or more farms that supply the milk and cream to this city. This staff should be able to make four to five inspections per year of each place. The appointment of four country inspectors for Milwaukee cannot be considered in any way extravagant or disproportionate to the population. Table XI shows the number of people in the city to each country milk inspector in twelve large cities. The number of farms per inspector in ten cities is shown in Table XII. It will be noticed that Milwaukee has an unfavorable position in both tables. It is really more favorable than it should be as the two so-called country inspectors employed by the Health department, spend only a part of their time on dairy work and devote the major portion of their time to inspection and analytical work in the city.

Table XIII shows the percentage of farms inspected yearly in twelve large cities and the number of times of inspection per year. Milwaukee's showing is again unsatisfactory. In

TABLE XI.

NUMBER OF PEOPLE IN CITY TO EACH COUNTRY MILK INSPECTOR.

1.	Wshington	1	Inspector	to	55,178	People
2.	Richmond	1	“	“	63,814	“
3.	Los Angeles	1	“	“	63,839	“
4.	Seattle *	1	“	“	79,064	“
5.	Cleveland	1	“	“	93,444	“
6.	Boston	1	“	“	111,764	“
7.	Detroit	1	“	“	116,441	“
8.	New York	1	“	“	148,962	“
9.	*Milwaukee* †	1	“	“	186,928	“
10.	San Francisco	1	“	“	208,456	“
11.	Baltimore	1	“	“	279,242	“
12.	Chicago	1	“	“	312,183	“

* Inspectors do all the city work as well.

† While called country inspectors, they devote most of their time to city milk work, and also analyze all samples collected by them.

TABLE XII.

COUNTRY INSPECTION OF FARMS FURNISHING MILK ONLY.

		No. of Country Inspectors.	No. of Farms.	No. of Farms per Inspector.
1.	Richmond	2	132	66
2.	Washington	6	1,091	182
3.	Seattle †	3	700	233
4.	Detroit	4	2,000	500
5.	*Milwaukee* *	2	1,600	800
6.	Cleveland	6	3,500 to 6,000	583 to 1,009
7.	Boston	6	6,000	1,000
8.	Baltimore	2	2,300	1,150
9.	New York	32	44,000	1,375
10.	Chicago	7	12,000	1,714

† Inspectors do all the city work as well.

* While called country inspectors they devote most of their time to city work.

all the cities except Baltimore and Milwaukee, the sanitary conditions of dairy farms must be approved before milk is sent to the city. This is a particularly strong point and is not possible of attainment unless a staff of country inspectors is maintained.

Pasteurization of Milk and Cream

It has been pointed out that about 59% of the entire milk supply is pasteurized, and that 80% of the cream is similarly treated (not including cream for ice-cream factories). On account of the importance of pasteurization special attention was paid to this subject. The average score of pasteurizing plants was 56.1. This is about twelve points higher than the average for all milk plants. Only the larger plants pasteurize, and these plants are generally conducted in a much more sanitary manner than are those of their smaller competitors. Bacteriological tests of the efficiency of pasteurizing were also made during the month of July. One plant was tested four times; sixteen, three times; two, twice; and two, once. In all, twenty-one plants were tested, and fifty-nine complete investigations made.

TABLE XIII.

FARM INSPECTION.

	Per Cent. Inspected Annually.	No. of Times per year Inspected.	Improvement due to Score card.	Minimum Score Requirement.	Must sanitary conditions be approved before milk is sent to City.
Cleveland	100%	4	Yes	Yes	Yes
Detroit	100%	..	Yes	No	Yes
Chicago	50%	No regular time	Yes	No	Yes
Los Angeles	100%	12-36	Partly	No	Yes
Richmond	100%	12	Partly	Yes	Yes
Washington, D. C.	100%	2-4	Partly	No	Yes
New York	100%	1½	Partly	No	Yes
Boston	Just begun	1	Yes	Yes	Yes
Seattle	75%	4	Yes	Yes	Yes
San Francisco	100%	4	Yes	Yes	Yes
Milwaukee	20-25%	No regular time	Just adopted	No	No
Baltimore	7%	—	Yes	No	No

Table XIV shows the names of the different machines tested, the temperature of pasteurization at the different tests, the temperature of the milk coming from the coolers, the method of cooling, and the scores. Table XV summarizes this larger table for flash pasteurization temperatures. It will be noted that out of fifty-two tests on flash machines, thirty-five or 67.3%, were run at temperatures under 160 degrees. Table XVI summarizes the findings with regard to the temperature of the milk coming from the cooler. Twelve out of fifty-nine observations, or 20.4%, showed temperatures over the legal limit of fifty degrees. This is due to the fact that some dealers use only lake water to cool their milk. The temperature of this water is extremely variable and it cannot be relied upon to cool milk, particularly in the summer months. The importance of thorough cooling need not be emphasized. All plants of this kind should have no difficulty in cooling their milk down to the legal standard.

The efficiency of pasteurization, as measured by the difference in the number of bacteria in the raw milk and the milk as it came from the machine, was on the whole satisfactory. This was partly due to the fact that the raw milk in many instances had excessive numbers of bacteria present and therefore the percentage of removal by the heating treatment was very large. Table XVII shows the results of the examination of the raw milk delivered to the pasteurizers. Of the sixty samples analyzed, fifty-four, or 91.8%, had more than 250,000 bacteria to the cubic centimetre, and forty-nine or 81.8% more than half a million.

Forty-one samples were taken from "comebacks"—that is, from bottles which had been returned from the wagon unsold—twenty of these or 48.8% showed more than 250,000 bacteria per c. c. The results are given in Table XVIII. The necessity for icing milk on the wagons is brought out by these analyses.

A great deal of sour milk is returned by the dealers to the farmers. This waste could undoubtedly be greatly reduced if the milk were produced and transported under sanitary conditions. Poor methods in cooling and bottling milk were found in a number of cases to practically undo the benefits of pasteur-

TABLE XIV.

FLASH PASTEURIZERS.

Make of Machine.	No. of Plant.	No. of cans of milk pasteurized.	Past. Temp.			Temp. of milk coming from cooler.			Method of cooling.	Score of milk depot.
			1	2	3	1	2	3		
Reed	1	35	166	148	155	50	45	40	Brine	64
"	2	16	160	160	160	45	45	45	Ice w. and city w.	57
"	3	15	160	154	165	50	60	50	City water	39.5
"	4	16	162	168	...	45	45	..	Ice w. and lake w.	32.5
"	5	22	160	164	160	39	50	50	Ice water	67
"	6	15	158	155	160	40	50	50	Ice w. and city w.	60
"	7	8	158	155	...	50	50	..	Ice w. and city w.	47.5
"	8	20	160	155	160	50	50	50	Ice and lake w.	64
Gehl	9	22	160	165	155	55	53	50	City water	..
"	10	50	150	130	162	58	58	48	City water	59
"	11	50	156 166	160	170	62	60	50	Ice w. and city w.	41.8
"	12	20	152	155	155	60	50	46	City water	49
Commercial	13	400	178	160	171	43	36	40	City w. and brine	43.5
"	14	25	170	155	...	52	45	..	Ice w. and city w.	42.5
"	15	16	152	...	...	50	..	..	Ice water	..
Farrington	16	12	154	156	155	40	42	40	Ice w. and lake w.	53
"	17	32	155	160	158	50	48	45	Ice water	59
Miller-Tyson	18	100	176	160	178	50	45	55	Ice w. and brine	71.7
Miller	19	100	164	170	163	46	52	58	Ice w. and city w.	58.5
HOLDER PASTEURIZERS.										
Farrington (22 minutes)	20	150	142	146	146	36	36	36	Cold w. and brine	62.5
Wilman (26 minutes)	21	1,600-1,700	145	145	145	30	31.5	32	Brine and ice w.	93

Temperatures given in this chart are those noted by the bacteriologist who made the tests.

TABLE XV.

TEMPERATURE OF FLASH PASTEURIZATION.

Temp. Fahrenheit.	No. of Observations.	Per Cent.
130-140	1	1.9
141-150	2	3.9
151-155	14	26.9
156-160	18	34.6
161-165	7	13.5
166-170	6	11.5
171-180	4	7.7
Totals	52	100.0

Maximum temperature observed	178
Minimum temperature observed	130

TABLE XVI.

TEMPERATURE OF MILK IN COOLER.

Temp. Fahrenheit.	No. of Observations.	Per Cent.
31-35	4	6.8
36-40	9	15.2
41-45	12	20.3
46-50	22	37.3
51-55	6	10.2
56-60	5	8.5
61-65	1	1.7
Totals	59	100.0

TABLE XVII.

RAW MILK AT PASTEURIZING PLANTS.

No. of Bacteria per C. C.	No. of Observations.	Per Cent.
Less than 10,000	0	.0
10,000- 50,000	1	1.6
50,000-100,000	1	1.6
100,000-250,000	3	5.0
250,000-500,000	6	10.0
500,000 and over	49	81.8
Totals	60	100.0

TABLE XVIII.

"COMEBACKS."

No. of Bacteria per C. C.	No. of Observations.	Per Cent.
Less than 10,000	1	2.4
10,000 to 50,000	9	21.9
50,000 to 100,000	4	9.8
100,000 to 250,000	7	17.1
250,000 to 500,000	4	9.8
500,000 and over	16	39.0
Totals	41	100.0

izing; in some instances there were found to be more bacteria in the bottled milk than in the raw milk before pasteurizing. Not enough care is taken in some places to keep the apparatus thoroughly clean or to wash the bottles efficiently. Many owners of pasteurizers merely look upon the machine as a device to retard souring. The sanitary aspect of the problem is overlooked. It is extremely doubtful whether any tubercle bacilli of bovine origin that are present in the milk would be killed by the temperature used by some dealers.

Pasteurization may be dangerous unless properly controlled. There is need of constant inspection, control by bacteriological tests, and proper ordinances defining and regulating the practice.

TRANSPORTATION OF MILK

Under normal conditions milk is brought into the city as follows:

Wagons	2,000 cans per day
Milwaukee Northern Electric R. R.	350 cans per day
Chicago & Northwestern R. R.	145 cans per day
C. M. & St. P. R. R.	1,400 cans per day

There is some fluctuation in the above and the milk shed of the city is by no means stable. Shortness of milk is one section and heavy demands for cream for ice cream factories, cause milk to be brought at times from considerably greater distances. It is probable that a great deal of milk is produced by farmers within comparatively short distances of the city and sold by them to cheese factories, condenseries and creameries, which might be diverted into the city market. These producers might be willing to sell their milk to the city if they could get a better price for it.

The milk brought in by wagon is in the hands of forty-three men, who own fifty-three wagons They collect the milk in the country and deliver it to the dealers in the city, charging fifteen to eighteen cents per can for transportation. Most of the wagons are covered but are usually without ice. Seventeen wagons come from ten to sixteen miles and the trips last from three to seven hours, varying of course with the weather and condition of the roads. To save space on the wagons cans that are not completely filled are at times filled up with milk from other farms. Milk is picked up by drivers of the wagons, and in order to save time, farmers living on side roads, carry their milk down to the main road and leave it in some instances unprotected from man or elements until the wagon comes along. Some milk is left exposed for a considerable time.

The condition on the electric and steam railroads is not very dissimilar. Milk is left at the depots and eventually taken up by the milk train, transported uniced to the city and then carted to the dealers. One or two special consignments are iced during hot weather. The rates paid for the transportation of milk on the electric and steam railroads naturally vary a great deal with the distance the milk is carried.

The amount of milk shipped by electric lines is small. It would undoubtedly be increased if the embargo prohibiting the transit of freight into the city were lifted. All milk brought by such lines has to be unloaded at the city limits and transferred by wagons to its final destination.

Under the present transportation arrangements the temperature of the milk is given practically no consideration. It is given plenty of opportunity to become heated before it arrives in the city even if originally cool when delivered by the farmer, and it is apt to be on a fair way to souring, if it has not already reached that condition.

Table XIX gives the results of seventy-four temperature readings of milk made at the railroad terminals in the city on the arrival of milk trains. The tests were made in May. In no instance was a sample found conforming to the legal standard. It was not to be expected under the conditions of shipment. Fifty-eight of the seventy-four samples were above 60 degrees and nine samples had temperatures over 70 degrees. It is not to be thought that the high temperature of the milk is due entirely to the methods of transportation.

TABLE XIX.

MILK TEMPERATURES.

Samples taken at City R. R. Terminals.

	No. of samples below 50°	No. 50°-55°	No. 55°-60°	No. 60°-65°	No. 65°-70°	No. 70°-75°	No. 75°-80°	Maximum Temp.	Minimum Temp.	Total Samples.
May 25th, 1911— Outside temp. 76° F. at 8:30 A. M... Shipped 14 miles.	0	2	1	4	4	1	0	70°	52°	12
May 26, 1911— Outside temp. 80° 8-11 A. M........ Shipped 16 miles.	0	0	0	5	0	0	0	64°	60°	5
" 21 "	0	0	1	4	4	1	0	74°	58°	10
" 27 "	0	0	0	2	3	4	2	78°	60°	11
" 30 "	0	0	0	0	6	1	0	74°	66°	7
" 42 "	0	0	0	3	2	0	0	68°	62°	5
Misc. samples—Temp. 74°............	0	1	2	16	5	0	0			24
Totals	0	3	4	34	24	7	2	—	—	74

No. within standard........... 0   Maximum temp........ 78° F.   Minimum temp............ 52° F.

Table XX shows the results obtained in May by Health department inspectors, who took the temperature of milk on the road as it was taken up from the farms by a wholesale wagon.

TABLE XX.

TEMPERATURE OF THE MILK AS COLLECTED BY WHOLESALE WAGON ON ITS WAY TO THE CITY.

May 28, 1911.

No. of samples.	Outside Temperature.	% at 50° F. and below.	51° to 55°	56° to 60°	61° to 65°	66° to 70°	71° to 75°	76° to 80°
30	76°	6.6	3.3	23.3	26.9	23.3	13.3	3.3

Minimum temperature, 48°. Maximum temperature, 78°.

Only 6.6% of the milk was below 50°, 68% was above 60° and 16.6% over 70°. It is evident that the farmer has much to learn concerning the necessity of cooling his milk. Tables XXI, XXII and XXIII show the conditions of collection for three wholesale wagons, and the temperatures of the milk at the times of collection and delivery. These tables again point out the high temperatures at which milk is delivered to the wagon and also demonstrate the fact that before the milk is finally delivered to the dealer in the city its temperature has greatly increased. The increases would have been even greater if the tests were made on days when the air temperatures were higher.

Table XXIV shows the temperatures of milk at the time of collection by an electric railway.

The transportation of milk presents peculiar difficulties. It is a problem by itself. It is essential that milk produced under sanitary conditions and handled in the city in a like manner, should be safeguarded in transit in every way. The sanitary chain is no stronger than its weakest link. In order that transportation may not cause a deterioration in the milk there should be: (1) proper facilities for storing the milk until it is collected, (2) rapid delivery to the city in suitable iced wagons or refrigerator cars, and (3) absolute cleanliness and non-interference with the milk during transit.

TABLE XXI.

COLLECTION BY WHOLESALE WAGON.

August 28, 1911.

Showing Conditions of Collection and Temperature of Milk at Time of Collection and Delivery.

Shipper's No.	Place Where Milk Collected.	Time Collected.	Time Delivered.	Temperature When Collected.	Temperature When Delivered.
1.	Cold water tank at farm......................	7:00 A. M.	9:00 A. M.	52°	62°
2.	" " " " "	7:05 A. M.	9:15 A. M.	54°	64°
3.	" " " " "	7:10 A. M.	9:00 A. M.	50°	62°
4.	" " " " "	7:15 A. M.	8:30 A. M.	50°	64°
5.	" " " " "	7:20 A. M.	9:20 A. M.	53°	63°
6.	" " " " "	7:25 A. M.	9:20 A. M.	56°	62°

Air temperature at first collection, 54°.

Air temperature at last delivery, 66°.

Total miles traveled to city limits, 4½.

Total time consumed, 2 hrs. 20 min.

TABLE XXII.

COLLECTION BY WHOLESALE WAGONS.

August 29, 1911.

Showing Conditions of Collection and Temperature of Milk at Time of Collection and Delivery.

Shipper's No.	Place Where Milk Collected.	Distance in Miles Brought by Shipper to Wholesaler.	Time Collected, A. M.	Time Delivered. A. M.	Temperature. When Collected.	Temperature When Delivered.
1.	At farm of driver of wagon	2	7:00	11:00	50°	64°
2.	" " " " " "	2	7:00	11:00	52°	63°
3.	" " " " " "	2	7:00	11:00	50°	62°
4.	" " " " " "	½	7:00	11:00	53°	63°
5.	" " " " " "	1	7:00	10:45	56°	63°
6.	Cold water tank at farm		7:10	10:15	50°	64°
7.	" " " " "		7:15	10:15	46°	60°
8.	" " " " "		7:20	10:15	50°	62°
9.	" " " " "		7:25	10:15	54°	61°
10.	" " " " "		7:30	10:15	56°	64°
11.	" " " " "		7:35	10:15	57°	66°
12.	" " " " "		7:40	10:15	51°	67°
13.	" " " " "		7:45	10:15	49°	62°
14.	" " " " "		7:50	10:15	52°	64°
15.	" " " " "		7:55	10:15	50°	64°
16.	" " " " "		8:00	10:15	56°	64°
17.	" " " " "		8:15	10:15	54°	63°
18.	" " " " "		8:15	10:45	55°	62°
19.	" " " " "		8:20	10:45	50°	62°
20.	" " " " "		8:25	10:45	51°	62°
21.	" " " " "		8:30	10:45	53°	64°
22.	" " " " "		8:35	10:45	50°	61°
23.	" " " " "		8:40	10:45	54°	64°

Air temperature at first collection, 56°.
Air temperature at last delivery, 68°.

Total miles traveled to city limits, 13.
Total time consumed, 4 hours.

TABLE XXIII.

COLLECTION BY WHOLESALE WAGONS.

August 30, 1911.

Showing Conditions of Collection and Temperature of Milk at Time of Collection and Delivery.

Shipper's No.	Place Where Milk Collected.	Distance in Miles Brought by Shipper to Wholesaler	Time Collected. A. M.	Time Delivered.	Temperature When Collected.	Temperature When Delivered.
1.	From farm at roadside	¾	6:30	1:05 P. M.	56°	64°
2.	“ “ “ “	1½	6:30	*	57°	*
3.	“ “ “ “	¾	6:30	*	58°	*
4.	Cold water tank at farm	...	6:35	11:30 A. M.	52°	58°
5.	From farmer at roadside	1	6:50	12:30	57°	62°
6.	Cold water tank at farm	...	6:55	12:50	56°	60°
7.	“ “ “ “ “	...	6:55	12:15	60°	62°
8.	From farmer at roadside	1½	7:00	12:50	56°	62°
9.	“ “ “ “	1½	7:10	*	55°	*
10.	“ “ “ “	1½	7:15	11:30	45°	56°
11.	“ “ “ “	¼	7:20	11:20	53°	58°
12.	“ “ “ “	2	7:20	11:20	48°	60°
13.	“ “ “ “	1½	7:25	*	49°	*
14.	“ “ “ “	½	7:25	11:45	61°	63°
15.	Cold water tank at farm	...	7:30	12:00	56°	62°
16.	From farmer at roadside	1½	7:35	*	62°	*
17.	From roadside (unprotected)	¼	7:35	12:00	58°	60°
18.	From farmer at roadside	1¼	7:40	11:45	59°	56°
19.	“ “ “ “	¾	8:10	12:15	60°	62°
20.	Cold water tank at farm	...	8:20	12:15	56°	60°
21.	“ “ “ “ “	...	8:40	12:00	59°	62°
22.	“ “ “ “ “	...	8:45	12:30	60°	60°
23.	“ “ “ “ “	...	9:40	*	50°	*
24.	“ “ “ “ “	...	9:40	*	56°	*
25.	“ “ “ “ “	...	9:40	12:30	64°	64°

Air temperature at first collection, 50°.
Air temperature at last delivery, 70°.
Total time consumed, 5 hours 35 minutes.

Total miles traveled to city limits, 16.

* The milk from these shippers was transferred to a small wagon five miles from city limits. Small wagon delivers this milk to two city dealers.

TABLE XXIV.

COLLECTION BY ELECTRIC RAILWAY.

September 1, 1911.

Showing Temperatures of Milk at Time of Collection.

Station Name or Number.	Time, A. M.	Temperature of Milk in degrees F. when picked up by train. Only one reading of temperature is from any one shipper.
Port Washington	8:25	67, 63, 64, 66
24	8:30	69, 69
23	8:35	70, 64
22	8:50	82, 76
21	9:00	68, 78
18	9:15	78, 70, 67, 50, 68, 66, 48, 66, 78, 69, 56, 76, 67, 67
17	9:20	68, 70, 72
16½	9:30	60, 58, 64, 66, 56, 64, 50, 52, 64, 66, 64, 70
16	9:50	66, 69, 65, 66, 56, 76, 56, 54, 64, 50, 66, 50, 50, 66
15	9:55	66, 50, 64, 65, 66, 50, 50, 50, 70, 71, 73, 67
14	10:00	66
Thiensville	10:05	67, 67, 56, 55, 64, 66, 65
Mequon	10:10	58, 66, 68, 64
9	10:20	68, 70, 56, 66
8	10:23	66

Outside temperature at start, 80°. Distance, 30 miles.
Outside temperature at finish, 88°. Time consumed, 2 hours.

Stations where milk is taken on are merely platforms situated where the roads cross the tracks. The milk is absolutely unprotected on these platforms. In one case it was discovered that the milk had been standing on the platform for 1 hour and 15 minutes before picked up by the train.

The problems of transportation will not be solved until all milk is shipped in sealed cans, icing stations provided at depots, and refrigerator cars used. The solution of the problem is eminently associated with the economic phase of the milk problem.

BACTERIOLOGY OF MILWAUKEE MILK SUPPLY

With an idea of obtaining some insight into the number of bacteria in Milwaukee milk, samples were taken from stores, wholesale wagons, milk plants, and railroad receiving stations.

Table XXV gives the result of the examination of 117 samples of milk as taken from wholesale wagons. Eighty-two samples, or 70.1%, had more than 250,000 bacteria per c. c.,

TABLE XXV.

WHOLESALE WAGONS.

Bacteria per cubic centimetre.

	Number.	Per Cent.
Less than 10,000	0	0
10,000 to 50,000	6	5.1
50,000 to 100,000	7	5.98
100,000 to 250,000	22	18.80
250,000 to 500,000	19	16.2
500,000 to 1,000,000	16	13.7
1,000,000 to 5,000,000	32	27.4
5,000,000 and above	15	12.8
Totals	117	100.0

TABLE XXVII.

RAILROAD RECEIVING STATIONS.

Bacteria per cubic centimetre.

	Number.	Per Cent.
Less than 10,000	0	0
10,000 to 50,000	3	5.8
50,000 to 100,000	7	13.5
100,000 to 250,000	11	21.2
250,000 to 500,000	8	15.3
600,000 to 1,000,000	8	15.3
1,000,000 to 5,000,000	10	19.2
5,000,000 and over	5	9.6
Totals	52	100.0

Highest count	10,800,000
Lowest count	11,000

TABLE XXVI.

DETAILS OF BACTERIOLOGICAL ANALYSES OF MILK FROM WHOLESALE WAGONS.

	Less than 10,000	10,000 to 50,000	50,000 to 100,000	100,000 to 250,000	250,000 to 500,000	500,000 to 1,000,000	1,000,000 to 5,000,000	5,000,000 and above	Totals	Maximum	Minimum
1	0	0	1	1	2	1	5	4	14	16,200,000	95,000
2	0	0	0	4	0	0	0	0	4	230,000	140,000
3	0	0	0	5	3	2	2	1	13	6,300,000	220,000
4	0	0	0	0	1	2	3	1	7	9,525,000	485,000
5	0	0	0	2	1	0	4	2	9	7,440,000	125,000
6	0	1	1	2	0	0	1	1	6	16,200,000	45,000
7	0	2	1	0	0	1	3	1	8	5,200,000	20,000
8	0	0	0	0	0	0	1	1	2	6,300,000	1,665,000
9	0	0	2	3	4	3	4	0	16	4,180,000	60,000
10	0	0	0	0	4	0	2	3	9	13,200,000	270,000
11	0	1	0	0	0	3	5	1	10	8,400,000	40,000
12	0	2	2	5	4	4	2	0	19	1,610,000	40,000
Totals	0	6	7	22	19	16	32	15	117		

forty-seven, or 40.2%, more than one million, and fifteen, or 12.8%, more than five million. Comment seems unnecessary. It indicates gross negligence or ignorance, or both. The details of this bacteriological investigation of the milk from wholesale wagons are given in Table XXVI.

Compare the above with the record of Richmond, Virginia, for 1910. Although a southern city and having to contend with hot weather for a great part of the year, not a single sample out of 1,610 samples examined in that year showed over 500,000 bacteria per c. c. This shows the result of inspection, co-operation, and education.

Table XXVII gives the results of the examination of fifty-two samples of milk taken at the railroad receiving stations. Twenty-nine samples, or 59.4%, had more than 250,000 bacteria per c. c., fifteen, or 28.8%, one million or more, and five, or 9.6%, more than five million. With both wagon and railroad milk counts of over ten million were not uncommon.

Table XXVIII gives the analytical results of forty-eight samples of milk taken from stores. Twenty samples, or 41.6%, showed more than 250,000 bacteria per c. c., seven, or 14.6%, one million or more, and two, or 4.2%, more than five million. The majority of store samples were of pasteurized milk.

Table XXIX shows the results of bacteriological examinations of ice cream and is introduced here to indicate the need for work along this line.

Bacteriological examinations of milk are made by the bacteriologist of the department, but he is kept so busy with other routine work that he has very little time for milk.

The following table shows the number of samples of milk examined bacteriologically during the past five years:

1906	97
1907	161
1908	55
1909	54
1910	110

The importance of bacteriological examinations of milk has been well demonstrated in a large number of cities, and such

TABLE XXVIII.

STORES.

Bacteria per cubic centimetre.

	Number.	Per Cent.
Less than 10,000	0	0
10,000 to 50,000	13	27.1
50,000 to 100,000	8	16.66
100,000 to 250,000	7	14.6
250,000 to 500,000	8	16.66
500,000 to 1,000,000	5	10.4
1,000,000 to 5,000,000	5	10.4
5,000,000 and above	2	4.2
Totals	48	100.00

Highest count 15,000,000
Lowest count 19,000

TABLE XXIX.

BACTERIOLOGICAL EXAMINATION OF 26 SAMPLES OF ICE CREAM.

No. of Bacteria per c. c.	No. of observations.	Per Cent.
100,000 to 250,000	1	3.8
250,000 to 500,000	1	3.8
500,000 to 1,000,000	4	15.4
1,000,000 to 5,000,000	15	57.7
5,000,000 to 25,000,000	2	7.7
25,000,000 or over	3	11.5
Totals	26	100.0

Highest count 8,000,000,000
Lowest count 200,000

examinations have been found to be a very useful adjunct in the campaign for a clean and properly handled milk.

Milwaukee has a bacteriological standard of 250,000 bacteria per c. c. How poorly it is lived up to has been already shown in this report. Pasteurizing plants can be kept at a higher efficiency if subjected to periodic bacteriological tests.

There is an increasing need and demand for bacteriological examinations to be made of dairy products, such as ice cream and butter. A sanitary bacteriologist could be kept very busy indeed, doing the work of the Food division of the Health department.

Frequent chemical tests for fats, total solids and preservatives are always accompanied by a decrease in the amount of sophistication and adulteration of milk, and frequent bacteriological and sediment tests are followed by a decrease in the number of bacteria and the amount of dirt found, which signifies a consequent improvement in the sanitary conditions under which the milk is handled.

Table XXX shows the number of bacteriological analyses of milk per 1,000 population made in twenty-four large cities. It will be noted that Milwaukee stands twentieth in the list of twenty-four.

CHEMICAL ANALYSES OF MILK

The analyses of milk and cream are made mostly by the sanitary inspectors. The number of samples analyzed during the past five years is given in the following table. These analyses are mostly butter fat determinations. Total solids are estimated by formula, except in special instances:

	Milk.	Cream.
1906	4,897	3,044
1907	5,067	2,935
1908	8,640	4,033
1909	8,272	5,083
1910	8,106	4,768
	34,982	19,863

It can readily be seen that the time consumed in making this large number of analyses is very considerable. In 1910,

TABLE XXX.

NUMBER OF SAMPLES OF MILK EXAMINED BACTERIOLOGICALLY.

Per 1,000 of Population in 24 Cities.

	City.	Year.	Samples tested per 1,000 Population.
1.	Fall River, Mass	1910	28.84
2.	New Haven	1909	27.58
3.	Nashville	1910	16.87
4.	Richmond	1910	12.58
5.	Boston	1909	9.64
6.	Memphis	1909	9.53
7.	Buffalo	1910	8.74
8.	Scranton	1910	7.85
9.	Rochester	1910	5.15
10.	Cleveland	1909	4.64
11.	Chicago	1910	4.59
12.	New York	1908	2.58
13.	Seattle	1909	2.33
14.	San Francisco	1909-1910	1.58
15.	Spokane	1910	0.63
16.	Bridgeport, Conn.	1910	0.54
17.	Cincinnati	1909	0.53
18.	St. Louis	1908-1909	0.52
19.	Minneapolis	1909	0.38
20.	*Milwaukee*	1910	0.29
21.	St. Paul	1909	0.19
22.	Detroit	1910	0.11
23.	Portland	1910	0.07
24.	Toledo	1910	0.06

3.94% of the samples of milk were below the 3% butter fat standard and 6.48% of the samples of cream were below the 18% butter fat standard.

Table XXXI gives a comparison of the number of samples of cream analyzed per 1,000 population in fourteen cities which listed separately in their annual reports the number of samples of milk and cream analyzed. It will be noted that Milwaukee analyzes many more samples of cream than any other city in the list. Table XXXII gives the same information for milk. With the exception of Kansas City, Milwaukee analyzes more samples than any other city. Table XXXIII gives similar information of twenty-seven cities, only the milk and cream analyses are here combined, as they were not given separately in many reports. Milwaukee stands first in the list.

There is no question that good results have followed the chemical work done on milk and cream by the Health department, but when it is remembered that the men who do practically all of the work, also have to do all the inspection and clerical work connected with milk and its products, it would seem that too much emphasis has been laid on the analysis of milk and cream. Furthermore, the number of samples of cream analyzed seems altogether disproportionate to the amount of cream consumed in the city. This chemical work should not be done by milk inspectors, but by a chemist who stays in the laboratory.

TABLE XXXI.

NUMBER OF SAMPLES OF CREAM EXAMINED CHEMICALLY.

Per 1,000 of Population in 14 Cities.

	City.	Year.	Samples tested per 1,000 Population.
1.	*Milwaukee*	1910	12.75
2.	Denver	1910	4.43
3.	Spokane	1910	3.46
4.	Washington, D. C	1909	2.9
5.	St. Louis	1909	2.77
6.	Grand Rapids	1910	1.74
7.	Minneapolis	1909	1.04
8.	Kansas City	1910	.76
9.	Worcester	1910	.68
10.	Rochester	1910	.19
11.	New York	1908	.11
12.	Detroit	1910	.08
13.	Cleveland	1909	.07
14.	Buffalo	1910	.01

TABLE XXXII.

NUMBER OF SAMPLES OF MILK EXAMINED CHEMICALLY.

Per 1,000 of Population in 14 Cities.

	City.	Year.	Samples tested per 1,000 Population.
1.	Kansas City	1910	26.27
2.	*Milwaukee*	1910	21.68
3.	Rochester	1910	16.53
4.	Washington, D. C	1909	10.82
5.	Worcester	1910	10.27
6.	Grand Rapids	1910	9.00
7.	Cleveland	1909	8.91
8.	Denver	1910	5.96
9.	St. Louis	1908-1909	5.46
10.	Spokane	1910	4.27
11.	Minneapolis	1909	3.23
12.	Detroit	1910	2.92
13.	New York	1908	1.48
14.	Buffalo	1910	.67

TABLE XXXIII.

NUMBER OF SAMPLES OF MILK AND CREAM EXAMINED CHEMICALLY PER 1,000 OF POPULATION IN 27 CITIES.

City.	Year.	Samples tested per 1,000 Population.
1. *Milwaukee*	1910	34.43
2. Kansas City	1910	27.03
3. Boston	1909	21.97
4. Lowell	1910	21.63
5. New Haven	1910	21.04
6. Chicago	1910	18.37
7. Rochester	1910	16.72
8. Toledo	1910	14.55
9. Washington, D. C.	1909	13.72
10. Richmond	1910	12.53
11. New Orleans	1909	12.14
12. Worcester	1910	10.95
13. Grand Rapids	1910	10.74
14. Denver	1910	10.39
15. Cleveland	1909	8.97
16. St. Louis	1908-1909	8.23
17. Spokane	1910	7.73
18. San Francisco	1909-1910	6.79
19. Seattle	1909	6.77
20. Scranton	1910	6.5
21. Nashville	1910	5.57
22. Minneapolis	1909	4.27
23. Portland	1910	3.24
24. Detroit	1910	3.00
25. New York	1908	1.59
26. Buffalo	1910	.68
27. Cincinnati	1909	.37

CONCLUSIONS

It is evident from the above considerations of the milk situation in Milwaukee that much has yet to be done to bring the standard up to a point where it can be considered satisfactory. It is realized that any solution of the milk problem such that a clean and safe milk can be assured to all is dependent on a number of factors. One of these is the proper adjustment of the economic questions that are involved. It costs more to produce clean than dirty milk and a need for a thorough study into the economic side of the question is imperative. At the present time the careful producer and dealer is working under a serious disadvantage; he gets no more for his milk than does the slovenly and careless handler, although it costs the former more to produce and handle. This is manifestly unfair. This unfairness can never be overcome unless certain minimum standards are set up which must be attained by all who wish to deal in milk and other dairy products. The mere establishment of standards and the passage of new ordinances will not solve the milk problem; there must be adequate inspection so that enforcement may be insisted on.

The work of the Health department on milk control is carried on by four milk inspectors, who are under the city chemist. The latter devotes only a small part of his time to milk work. Although paid out of the Health department appropriation, he has to act as industrial chemist to other departments, and analyze gas, coal, and cement. Two of the milk inspectors are called country inspectors. As a matter of fact these two inspectors devote only a part of their time to country inspection, most of their work being done in the city.

There is no question but that the present inspectors are very efficient in their work; they are all actively interested in it; and are by no means merely holding down their jobs; but it is manifestly impossible for these four men to inspect 1,900 dairy farms, 188 milk depots, 1,150 stores, railroad depots, and wagons, and to collect samples and analyze them themselves.

Chart I shows the present organization of the Health department with respect to milk, meat, and other food inspection.

Chart II shows the proposed reorganization of the work of the Health department as to food inspection.

It will be noticed that under this proposed reorganization there would be a chief of the entire division, and under him three sub-divisions, (1) Dairy Products, (2) Meat and Other Foods, (3) Food Laboratories. Such a method of organization has been adopted in many cities. It is considered better to have all those branches of the Health department dealing with foods of any kind under a single division. This is particularly necessary for the food laboratories. For particulars reference is made to the report on the reorganization of the Health department.

Chart I. Present Organization.

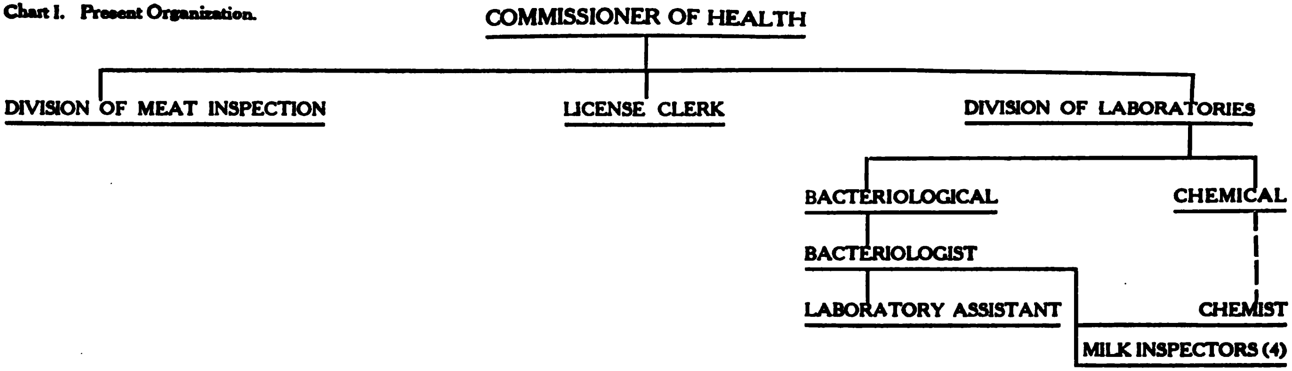
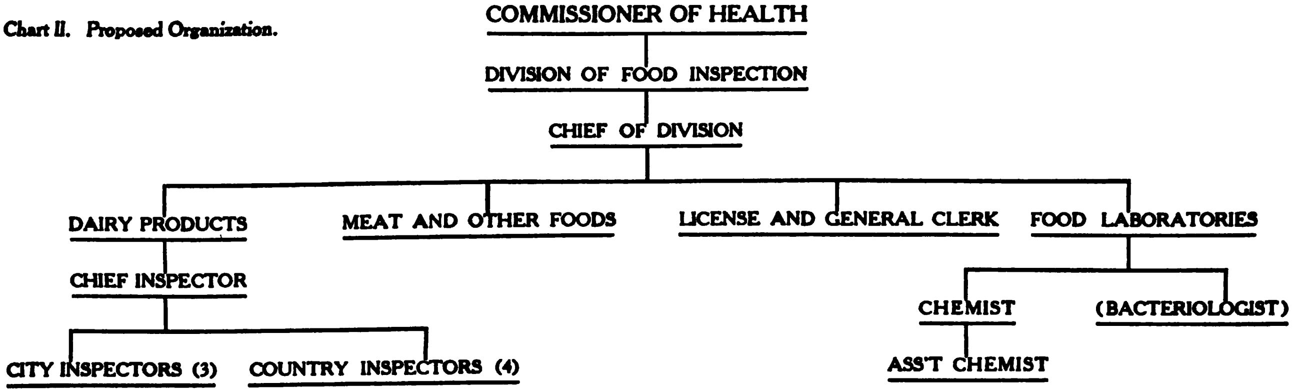


Chart II. Proposed Organization.



RECOMMENDATIONS

As a result of this study of the milk supply of the City of Milwaukee and the methods used by the Health department in its control, the following recommendations are made:

1. It is recommended that the work of meat, food, and milk inspection, carried on by the Health department, be reorganized and placed together in a division to be known as the Division of Food Inspection.

It is recommended that a chief be placed at the head of this new division and that he have complete charge of all the work of the Health department done in connection with the control of the supply of milk, meat, and all other foods.

2. It is recommended that this new division be divided into three sub-divisions, (1) Dairy Products, (2) Meat and Other Foods, and (3) Food Laboratories.

3. It is recommended that in addition to the four inspectors now employed there be appointed three additional milk inspectors, making a total of seven inspectors. It is recommended that four of these inspectors be detailed to the inspection of the dairy farms supplying the city with milk and cream, and to the inspection of all shipping stations. It is recommended that the three remaining inspectors be detailed to city work, including the inspection of milk depots, receiving stations and stores handling milk, and to the collection of samples for chemical and bacteriological analysis. It is recommended that in addition to the three new inspectors, an additional inspector, to be called the chief inspector be appointed, and that he spend all of his time in the supervision of the work of the other seven inspectors.

4. It is recommended that a chemist and bacteriologist be appointed, who shall perform respectively the chemical and bacteriological work of the division under the subdivision of food laboratories. Also that a clerk be appointed to attend to the keeping of proper records and the performance of other clerical work.

5. It is recommended that the chief of the Division of Food Inspection co-operate with the chief of the Division of Education and Publications to the end that all responsible and interested parties who handle milk and other dairy products

may be thoroughly educated to a realization of why clean milk is necessary, and how it must be produced, transported, and distributed. It is further recommended that active steps be taken to educate the public on the milk question, so that they may realize the importance of sanitary milk, demand such milk, and be willing to pay a fair price for it.

6. It is recommended that the Milk committee of the Child Welfare commission be asked to devise a plan for giving wide publicity to the results of inspection of dairy farms, milk depots and stores.

7. It is recommended that inasmuch as the solution of the milk problem is not merely sanitary but economic as well, and that much good would arise as the result of a careful study into the cost of milk production, transportation and distribution, that the Milk committee of the Child Welfare commission be asked to conduct such an investigation. It is recommended that special attention be paid to a study of the proper basis for the purchase of milk by city dealers from farmers. Most food stuffs are bought and sold on the basis of quality, while milk is largely purchased by quantity alone—dirty, thin milk costing the dealer the same as clean, rich milk. If the committee could devise a way by which dealers would pay for the milk bought from farmers on a basis of its chemical and sanitary quality, the solution of much of the difficulty of the milk problem would be in sight.

8. It is recommended that the present milk ordinances be thoroughly revised and modernized, and that the system of records now used in milk work by the Milwaukee Health department be altered to conform with the new ordinances. It is further recommended that particular attention be paid (1) to the regulations regarding the sanitary conditions under which milk and cream are produced, transported, handled, and distributed (including the methods of pasteurization) and (2) to the safeguarding of the milk supply from infection by specific disease germs on premises or among the employes of producers and handlers or among the families of such producers and handlers. It is recommended that the Milk committee of the Child Welfare commission assist the Health department in the drawing up of the new milk ordinances, so that the department may have the benefit of the advice of the committee.

APPENDIX A.

MAPS SHOWING THE SOURCES, AMOUNTS, AND LINES OF TRANSPORTATION OF THE MILWAUKEE MILK SUPPLY

The two maps appended have been prepared with a dual purpose, (1) to show the extent and complexity of Milwaukee's milk shed and the consequent need of a liberal inspectional staff, and (2) to aid in an economic study of the situation, which it is hoped will be undertaken at an early date by the Milk committee of the Child Welfare commission.

Map I shows the amount, source, and lines of entry of all milk brought into the city by wholesale wagons and retailing farmers. The small amount of cream which enters the city in the same manner is likewise here shown.

Map II gives similar information for milk entering by way of the two steam railroads and by the Milwaukee Northern Electric line. These two maps taken together give a good picture of the entire milk shed of the city.

A brief inspection of Map I is necessary to demonstrate the extreme complexity of the problem,—the number of farms, the distances the milk must come by wagon, the ample opportunity for contamination and infection through careless handling, the difficulty of preventing the heating of milk in transit with the resulting deterioration in quality,—these and many other facts are at once apparent and serve to emphasize the magnitude of the problem with which the Health department must grapple.

These conclusions, furthermore, coincide with the results of the investigations recorded in the body of this report, and with them form a powerful argument for an increased inspectional and laboratory staff.

While the railroad milk is not as a rule so long in transit as that brought by wagons, it is subject to other and equally bad conditions, which result in its arrival in the city in about as objectionable a condition.

The following table is compiled from Map I and shows (1) the number of farmers who send their milk to the city by wholesale wagons for distribution by city dealers, and (2) the number of farmers who retail directly the milk produced on their farms. This table also affords a classification of farmers according to the number of cans of milk they produce.

APPENDIX B.

At a meeting of the Milk committee of the Child Welfare commission on December 7, 1911, the following resolutions respecting the foregoing report were adopted:

WHEREAS, a pure milk supply is of prime importance to the health and lives of babies and adult citizens in Milwaukee, and

WHEREAS, the protection of the public health demands adequate inspection of all dairy farms under the auspices of the Milwaukee Health department, and

WHEREAS, the funds of the Health department at present are not sufficient to enable it to employ an adequate number of inspectors,

NOW THEREFORE BE IT RESOLVED, that the Milwaukee Milk committee urges the appropriation by the Common Council of a sum of money sufficient to enable the Milwaukee Health department to maintain, during the coming year, a force of seven milk inspectors with a chief inspector in charge, and a bacteriologist and chemist to give their entire time to milk work and a clerk to attend to the records of the office.

AND BE IT FURTHER RESOLVED, that a committee be appointed to urge the appropriation of this money upon the Mayor, the Board of Estimates and the Common Council.

— — — — —

WHEREAS, a report on the milk situation in Milwaukee has been prepared by Professor Selskar M. Gunn for the Bureau of Economy and Efficiency, in which a careful survey of the local milk situation has been made and recommendations proposed for improving the supply, and

WHEREAS, this report has been carefully read and edited by the Milwaukee Milk committee with the approval of Professor Gunn and the Bureau of Economy and Efficiency,

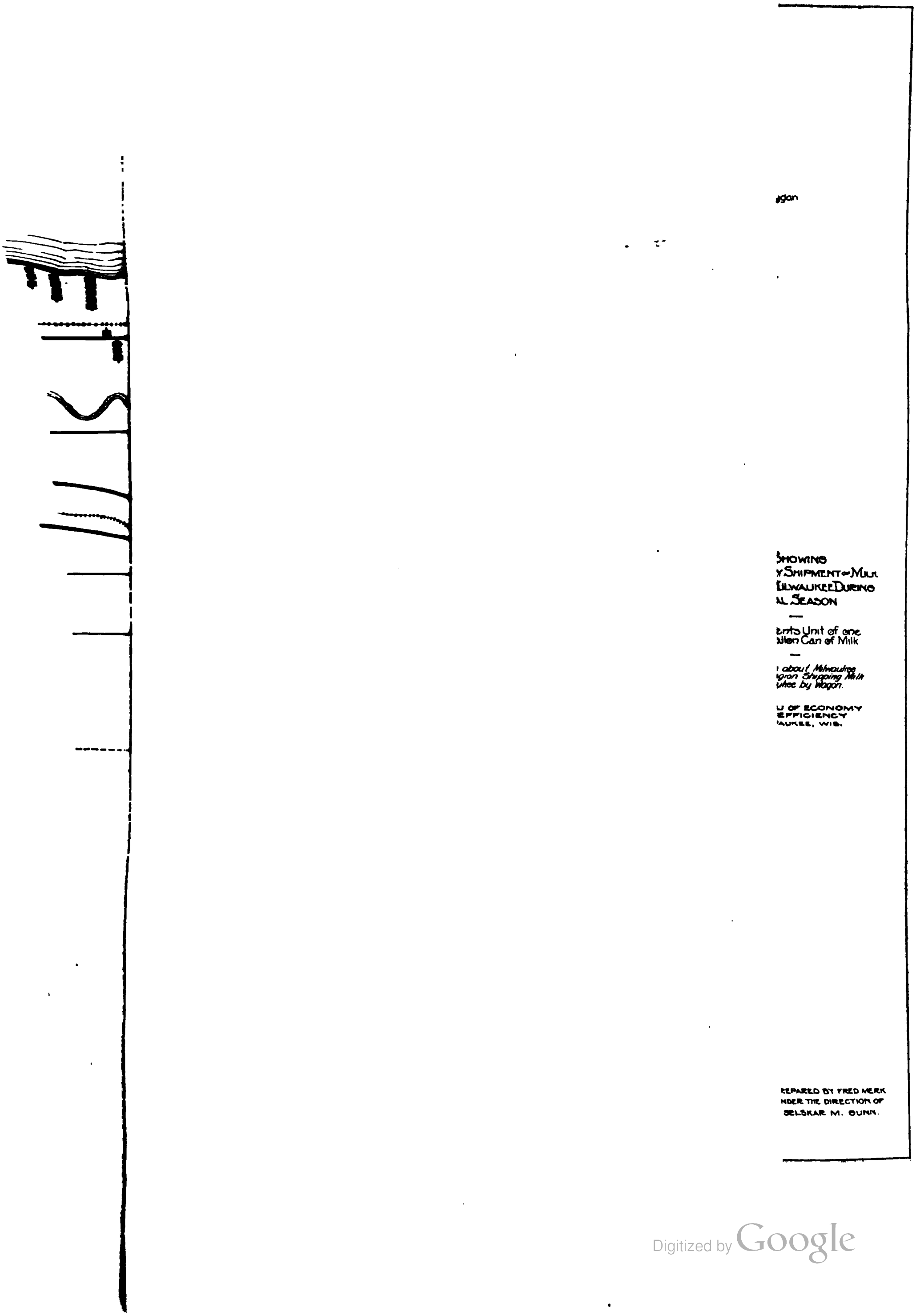
NOW THEREFORE BE IT RESOLVED, that the Milwaukee Milk committee heartily endorse this report and the recommendations appended thereto, and

BE IT FURTHER RESOLVED, that the Milwaukee Milk committee urge the immediate printing of this report in order that the facts presented by Professor Gunn and the recommendations which he has made, may be given wide publicity.

CLASSIFICATION OF MILK PRODUCERS WHO SHIP BY WAGON, BASED ON THE AMOUNT PRODUCED.

Ship by Wholesale Wagon.			Retail from Own Wagon.		
Amount Produced Daily (Cans).	Number of Farms.	Total Amount Produced (Cans).	Amount Produced Daily (Cans).	Number of Farms.	Total Amount Produced (Cans).
½	32	16	½	0	0
1	203	203	1	1	1
1½	73	109½	1½	0	0
2	257	514	2	6	12
2½	21	52½	2½	3	7½
3	156	468	3	3	9
3½	3	10½	3½	0	0
4	51	204	4	8	32
4½	1	4½	4½	2	9
5	34	170	5	2	10
5½	1	5½	5½	1	5½
6	12	72	6	8	48
7	2	14	7	0	0
8	0	0	8	7	56
9	1	9	9	3	27
10	1	10	10	1	10
Totals ...	848	1,862½	Totals ...	45	227

Total number of farms shipping by wagon................	893
Total number of cans of milk produced daily by these farms	2,089½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* Out of print.

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